Package ‘PHeval’

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Type Package
Title Evaluation of the Proportional Hazards Assumption with a Standardized Score Process
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Description Provides tools for the evaluation of the goodness of fit and the predictive capacity of the proportional hazards model.
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R topics documented:

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Description

This package provides tools for the evaluation of the goodness of fit and the predictive capacity of the proportional hazards model.

Details

Package: PHeval
Type: Package
Version: 0.5.1
Date: 2014-04-20
License: GPL (>=2.0)

This package provides functions to evaluate and plot the standardized score process of OQuigley (2003). The plot of this process over the ranks of the failure times gives an indication of the validity of the proportional hazards assumption. A function to evaluate the $R^2$ coefficient of OQuigley and Flandre (1994) is provided. This coefficient is a measure of the predictive ability of the proportional hazards model.

Author(s)

Cecile Chauvel <cecile.chauvel@upmc.fr>

References


Examples

library(survival)
S=standscore(futime+fustat~resid.ds+rx,data=ovarian)
plot(score(S,printCB = TRUE)
### Description

The function plots the standardized score process. This process is a list resulting of an appeal to the function `standscore`.

### Usage

```r
plotscore(s, printCB = FALSE, component.num = 1:dim(s[[1]])[2], main = "", xlab = "Time", ylab = "Standardized score", ylim)
```

### Arguments

- `s` A list resulting from a call to the function `standscore` which corresponds to the process and, possibly, its confidence bands.
- `printCB` Set `printCB = TRUE` for plotting the confidence bands. Default is `printCB = FALSE`.
- `component.num` A vector of length lower than the number of covariates. Indicates which components of the process to plot. For example, set `component.num = c(2,3)` for plotting the second and third components. By default, all components are plotted.
- `main, xlab, ylab, ylim` Classical arguments for plotting. See `help(plot)`.

### Author(s)

Cecile Chauvel <chauvel.cecile@gmail.com>

### See Also

- `standscore`

### Examples

```r
library(survival)
data(ovarian)

# Evaluation and plot of the standardized score process at parameter beta0 = 0
score1 = standscore(futime+fustat~age+rx, data=ovarian)
plotscore(score1, printCB=TRUE)
```

```r
# Evaluation of the standardized score process at parameter
```
# beta0 = maximum partial likelihood estimator of beta
beta=coxph(Surv(futime,fustat)-age+rx,data=ovarian)$coeff
score2=standscore(futime+fustat-age+rx,data=ovarian,beta0=beta)

# Separated plots for each regression effect
par(mfrow=c(1,2))
plotscore(score2,printCB=TRUE,component.num=1,main="age")
plotscore(score2,printCB=TRUE,component.num=2,main="rx")

###########################################################################
# Evaluation and plot of the standardized score process at parameter beta0 = 0
# without global standardization
score3=standscore(futime+fustat-age+rx,data=ovarian,.globstan=FALSE)
plotscore(score3)

---

**R2**

**R2 coefficient**

**Description**

This function calculates the $R^2$ coefficient of O'Quigley and Flandre (1994) to evaluate the predictive capacity of the proportional hazards model (or Cox model).

**Usage**

R2(formula, data)

**Arguments**

- **formula** A formula object or character string with the time and censoring status separated by "+" on the left hand side and the covariates separated by "+" on the right. For instance, if the time name is "Time", the censoring status is "Status" and the covariates are called "Cov1" and "Cov2", the formula is "Time+Status~Cov1+Cov2".

- **data** A data.frame with the data. The censoring status should be 1 for failure and 0 for censoring. No missing data accepted.

**Details**

The program does not handle ties in the data. We suggest to randomly split the ties before using the program.

**Value**

- If one covariate $Z$ is present in the model, the $R^2$ coefficient is

$$R^2 = 1 - \frac{\sum(Z_i - E_b(Z_i))^2}{\sum(Z_i - E_0(Z_i))^2},$$

where the sums are over the failures. \( E_b(Z_i) \) is the expectation of \( Z \) at the \( i \)th failure time under the model of parameter \( b \) = the maximum partial likelihood estimator of the regression coefficient. \( E_0(Z_i) \) is the expectation of \( Z \) under the model of parameter \( 0 \) at the \( i \)th failure time.

- If several covariates are present in the model, the \( R^2 \) coefficient is evaluated as in the previous case except that the covariate \( Z \) is replaced by the prognostic index \( b'Z \).

### Author(s)

Cecile Chauvel

### References


### Examples

```r
library(survival)
data(ovarian)
R2(futime+fustat~age,data=ovarian)
R2(futime+fustat~age+rx,data=ovarian)
```

### Description

This function evaluates the standardized score process of OQuigley (2003). The process helps evaluating the goodness of fit of the proportional hazards model and visualizing the shape of time-dependent effects.

### Usage

```r
standscore(formula, data, globstan = TRUE, beta0 = 0)
```

### Arguments

- **formula**: A formula object or character string with the time and censoring status separated by "+" on the left hand side and the covariates separated by "+" on the right. For instance, if the time name is "Time", the censoring status is "Status" and the covariates are "Cov1" and "Cov2", the formula is "Time+Status~Cov1+Cov2".
- **data**: A data.frame with the data. The censoring status should be 1 for failure and 0 for censoring. No missing data accepted.
- **globstan**: With one covariate in the model, globstan has no effect. With several covariates,
standscore

- if globstan = TRUE (default) a global standardization by the matrix Sigma is applied to the process. Sigma is the estimator of the variance-covariance matrix between the covariates to the power of - 1 / 2. With this standardization, each component of the process represents the cumulative regression effect of each covariate.

- if globstan = FALSE, no standardization is applied. In this case, the components of the process are dependent and do not reflect the shapes of the cumulative effects. The confidence bands are not given. The use of globstan = FALSE is aimed at performing tests of the value of the regression coefficients (null hypothesis: regression parameter = beta0).

beta0 a vector of parameters to evaluate the process (by default, parameters set to 0). Its length is the number of covariates. Each value corresponds to the regression coefficient for a covariate, in the same order as appearing in formula.

Details

The program does not handle ties in the data. We suggest to randomly split the ties before using the program.

Value

Score A vector or matrix with the value of the standardized score process. Each row corresponds to a failure time, each column to a covariate.

Sigma The matrix used for the standardization of the process. Sigma is the estimator of the variance-covariance matrix between the covariates to the power of - 1 / 2. This value is present only with multiple covariates and globstan = TRUE.

confbandCOV A matrix with the confidence bands of the process for a constant regression effect associated with the covariate named COV. Each row corresponds to a failure time. The first column is the lower band and the second column is the upper band. This value is present with one covariate or with multiple covariates and globstan = TRUE.

Author(s)

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References


standscore

See Also

plotscore

Examples

library(survival)
data(ovarian)

# Evaluation and plot of the standardized score process at parameter beta0 = 0
score1=standscore(futime+fustat~age+rx,data=ovarian)
plotscore(score1,printCB=TRUE)

# Evaluation of the standardized score process at parameter beta0 = maximum partial likelihood estimator of beta
beta=coxph(Surv(futime,fustat)~age+rx,data=ovarian)$coeff
score2=standscore(futime+fustat~age+rx,data=ovarian,beta=beta)

# Separated plots for each regression effect
par(mfrow=c(1,2))
plotscore(score2,printCB=TRUE,component.num=1,main="age")
plotscore(score2,printCB=TRUE,component.num=2,main="rx")

# Evaluation and plot of the standardized score process at parameter beta0 = 0
# without global standardization
fo="futime+fustat-age+rx"
score3=standscore(fo,data=ovarian,globstan=FALSE)
plotscore(score3)
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